EXECUTIVE SUMMARY
AIRCRAFT ACCIDENT INVESTIGATION
F-16 CG, S/N 90-0776
524TH EXPEDITIONARY FIGHTER SQUADRON (EFS), BALAD AB, IRAQ
27 NOVEMBER 2006

On 27 November 2006, at 1332 hours local time, an F-16 fighter aircraft, serial number (S/N) 90-0776, crashed 20 miles northwest of Baghdad while supporting friendly forces under enemy attack. The mishap aircraft (MA) was part of the 524th Expeditionary Fighter Squadron (EFS) deployed from Cannon AFB, NM to the 332nd Air Expeditionary Wing (AEW) Balad AB, Iraq. The mishap pilot (MP), deployed from Luke AFB, AZ was serving as the 332nd Expeditionary Operations Group (EOG) chief of standardization and evaluation (OGV). On the day of the mishap, he was flying with the 524th EFS. The MA impacted the target area and was destroyed. The MP made no attempt to eject and died immediately on impact. No personnel or objects on the ground were injured or destroyed during the crash.

The mishap sortie began as a non-traditional intelligence, surveillance, and reconnaissance (NTISR) mission. Approximately three hours into the sortie, a coalition helicopter made a hard landing and the MP's two-ship formation was tasked to provide NTISR support. A coalition ground force moving to secure the downed helicopter came under heavy attack from enemy forces employing small/medium caliber weapons and rocket propelled grenades (RPGs). The MP was tasked by the Joint Terminal Attack Controller (JTAC) to engage enemy vehicles with his 20 millimeter cannon. While the MP's wingman returned to the tanker to refuel, the MP worked with the JTAC to positively identify (PID) the enemy vehicles by making several low passes. With clearance to engage, the MP made a high angle strafe (HAS) pass and employed the gun at minimum range resulting in damage to an enemy vehicle. After recovering the aircraft at 200' above ground level (AGL), the MP immediately set up for a second attack that placed the MA too low and too close to his intended target. During the second dive, the MP pressed his attack below a recoverable altitude and impacted the ground. The resulting impact destroyed the aircraft and the MP sustained fatal injuries.

By clear and convincing evidence, the cause of the mishap was the MP's channelized attention manifested by his desire to maintain a constant visual positive identification of targeted enemy vehicles and subsequent target fixation on these vehicles while they were traveling at a high rate of speed. These two factors, when combined, caused the MP to begin, and then press his attack below a recoverable altitude.

By substantial evidence, a contributing factor was the pilot's excessive motivation to succeed while operating in a dynamic and stressful combat environment.

Under 10 U.S.C. 2254(d), any opinion of the accident investigators as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report may not be considered as evidence in any civil or criminal proceeding arising from an aircraft accident, nor may such information be considered an admission of liability by the United States or by any person referred to in those conclusions or statements.

SUMMARY OF FACTS

1. AUTHORITY, PURPOSE, AND CIRCUMSTANCES

a. Authority

On 3 January 2007, General Ronald E. Keys, Commander, Air Combat Command (ACC) appointed Brigadier General David L. Goldfein to conduct an aircraft accident investigation of the 27 November 2006 crash of an F-16CG aircraft, serial number (S/N 90-0776), approximately 20 miles northwest of Baghdad, Iraq. (Tab Y-1.1) Brigadier General Goldfein conducted the investigation at Holloman Air Force Base (AFB), NM, from 23 January 2007 through 20 February 2007. Technical advisors were Lieutenant Colonel (Legal), Major , (Maintenance), Major Medical), Captain (ACC Pilot), Captain (AETC Pilot), and Master Sergeant (Recorder). (Tab Y-1.1)

b. Purpose

This aircraft accident investigation was convened under Air Force Instruction (AFI) 51-503, *Aerospace Accident Investigations*. The primary purpose is to provide a publicly releasable report of the facts and circumstances surrounding the accident, to include a statement of opinion on the cause or causes of the accident, to gather and preserve evidence for claims, litigation, disciplinary and adverse administrative actions, and for all other purposes. In addition to setting forth factual information concerning the accident, the board president is also required to state his opinion as to the cause of the accident or the existence of factors, if any, that substantially contributed to the accident. This investigation is separate and apart from the safety investigation, which is conducted pursuant to AFI 09-204, *Safety Investigations and Reports*, for the purpose of mishap prevention. The report is available for public dissemination under the Freedom of Information Act, Title 5 United States Code (U.S.C.) Section 552 and the Air Force Supplement to Department of Defense (DoD) Regulation 5400.7, *Department of Defense Freedom of Information Act Program.*

c. Circumstances

The accident board was convened to investigate the Class A accident involving an F-16CG aircraft, S/N 90-0776, assigned to the 332d Air Expeditionary Wing (AEW), Balad Air Base (AB), Iraq, which crashed approximately 20 miles northwest of Baghdad while providing Close Air Support (CAS) to friendly forces under enemy attack.

2. ACCIDENT SUMMARY

On 27 November 2006, at 1332 hours local time, an F-16 fighter aircraft, S/N 90-0776, crashed 20 miles northwest of Baghdad while supporting friendly forces under enemy attack. The aircraft was part of the 524th Expeditionary Fighter Squadron (EFS) deployed from Cannon AFB, NM to the 332nd Air Expeditionary Wing (AEW) Balad AB, Iraq. The pilot, MP , was deployed from Luke AFB, AZ. He was serving as the 332nd Expeditionary Operations Group (EOG) chief of standardization and evaluation (OGV). On the day of the mishap, he was flying with the 524th EFS. The mishap aircraft (MA) impacted the target area and was destroyed. The Mishap Pilot (MP) made no attempt to eject and died immediately on impact.

The mishap sortie began as a non-traditional intelligence, surveillance, and reconnaissance (NTISR) mission. Non-traditional ISR includes using the targeting pod and visual means to find, fix, track, and potentially target threats to friendly forces. Approximately three hours into the sortie, a coalition helicopter made a hard landing and the MP's two-ship formation was tasked to provide NTISR support. A coalition ground force moving to secure the downed helicopter came under heavy attack from enemy forces employing small/medium caliber weapons and rocket propelled grenades (RPGs). The MP was tasked by the Joint Terminal Attack Controller (JTAC) to engage enemy vehicles with his 20 millimeter cannon. While the MP's wingman returned to the tanker to refuel, the MP worked with the JTAC to positively identify (PID) the enemy vehicles by making several low passes. With clearance to engage, the MP made a high angle strafe (HAS) pass and employed the gun at minimum range resulting in damage to an enemy vehicle. After recovering the aircraft at 200' above ground level (AGL), the MP immediately set up for a second attack. During the second dive, the MA impacted the ground. No attempt to eject was made and the MP died immediately on impact. No personnel or objects on the ground were injured or destroyed. The total loss of the MA was valued at $23,226,206.52. (Tab P-6)

3. BACKGROUND

a. The 332d Air Expeditionary Wing

The 332d Air Expeditionary Wing at Balad AB, Iraq is the most forward deployed Air Force wing in the Iraq war. Its' mission statement is: "Provide combat airpower for America." The wing employs weapons systems across the spectrum of air and space operations in support of Operation Iraqi Freedom. The wing utilizes aircraft such as the F-16 Fighting Falcon, A-10 II Thunderbolt and the MQ-1 Predator Unmanned Aerial Vehicle (UAV) for close air support and traditional/non-traditional intelligence, surveillance, and reconnaissance missions. The base is host to a C-130 squadron that provides intra- and inter-theater airlift, delivering passengers and cargo to bases around the country. The wing also operates a contingent of HH-60 helicopters that provides combat search and rescue capability for the entire Iraqi theater. In terms of aircraft

movements, Balad is the busiest single runway operation in DoD and second in the world only to London's Heathrow airport. (Tab EE-13.1)

b. The F-16 Fighting Falcon

The F-16C, "Fighting Falcon," is a single-engine, single seat, multirole tactical fighter with full air-to-air and air-to-surface combat capabilities. The F-16 flies at mach two and can climb to above 50,000 feet. The Fighting Falcon is capable of delivering a variety of ordnance. (Tab EE-12.1)

4. SEQUENCE OF EVENTS

a. Mission

The mission was planned as a two-ship Close Air Support (CAS) combat mission in support of Operation Iraqi Freedom (OIF) near Baghdad, Iraq. (Tabs V-1.7 and V-3.16) CAS missions in OIF are generally four to five hours in duration and include non-traditional intelligence, surveillance, and reconnaissance (NTISR) and precision guided munition (PGM)/strafe employment in support of friendly forces, often with US troops in contact (TIC) with enemy forces. (Tabs V-1.7, V-3.5 thru V-3.6, V-8.5) By definition, TIC situations are those where friendly forces are actively engaged with the enemy and are taking and returning fire. Missions can quickly change from relatively benign NTISR "overwatch" to weapons employment in a TIC situation. (Tabs V-3.17 thru V-3.18, EE-4.1) Targets for PGM and strafe employment vary from static buildings to enemy personnel on foot and in moving vehicles. (Tab V-3.6)

The two-ship flight was composed of the flight lead and mishap pilot, callsign MP MP , and his wingman, WM [redacted]. ; the 524th FS Commander, authorized the mission. (Tab T-1.1)

b. Planning

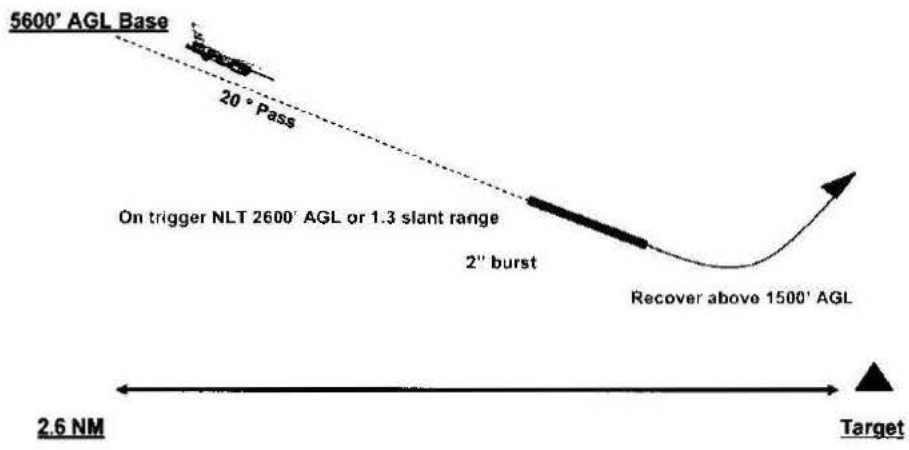
At approximately 0630 hours local time (L), MP and WM accomplished their mission planning which included signing the appropriate forms to fly, reviewing mission materials provided to them by the MPC (Mission Planning Cell), reviewing maps of the Area of Responsibility (AOR) and potential surface-to-air threats, an intelligence brief, a Ground Liaison Officer (GLO) brief, and a check of weather and Notices to Airmen (NOTAMS). (Tab V-1.6) NOTAMS inform aircrew of safety of flight information such as non-working navigation aids, activation of military working airspace, or changes in airfield conditions. The flight plan was filed in accordance with local operating instructions.

MP began the mission brief at approximately 0645L the day of the mishap in accordance with the 524th EFS Standard Mission Briefing guide. (Tab V-1.11) The briefing included an administrative brief on basic ground operations, taxi, take-off, departure, air-to-air refueling, and recovery procedures followed by a tactical mission brief. (Tab V-1.8) Hound 55's entire brief was thorough and understood by his wingman. (Tab V-1.10) MP 's tactical brief focused on the AOR, possible Joint Terminal Attack Controller (JTAC) callsigns and frequencies, and multiple weapons employment tactics to include Low-Angle Strafe (LAS) and High-Angle Strafe (HAS).

According to Air Force Instruction 11-2F-16, Volume 1, dated 8 Aug 2002 (current regulation at time of mishap), LAS is a method to employ the M61A1 (air-to-air and air-to-ground gun which employs 20 millimeter rounds) which was defined, at the time of the mishap, as an attack dive of less than or equal to 15 degrees nose low. HAS is defined as an attack dive of greater than 15 degrees nose low. The MP's wingman observed the MP writing valid wing standard LAS and HAS parameters on his personal line-up card for quick reference in flight. (Tab V-1.8 thru V-1.9)

The parameters the MP flight stepped to fly with for a high angle strafe pass are pictured in the following diagram. The attack is designed to achieve desired weapons effects and safely recover above 1500' AGL.

Planned/Briefed 20° High Angle Strafe Attack



No 524th EFS supervisory personnel attended the brief. Prior to stepping to the aircraft, both pilots assembled at the 524th EFS Operations Desk to obtain the Top 3 (squadron

supervisor) step brief and to review weather updates and any other information pertinent to the mission. (Tab V-1.10)

c. Preflight

A pre-flight inspection was accomplished by the crew chief on the mishap aircraft on the day of the mishap. This inspection is a flight preparedness check accomplished in accordance with directives. In addition, a walk around inspection was performed by the MP and crew chief on the morning of the mishap. No problems were noted during any of the preflight inspections. (Tab V-4.3)

All ground operations, to include start, taxi and takeoff, were accomplished in accordance with standard procedures. (Tabs V-1.10, V-4.3)

d. Flight

Start, taxi, and takeoff for both aircraft were unremarkable. MP flight departed Balad AB at 0935L (0635Z). (Tab T-1) Approximately an hour after takeoff, after MP flight had contacted their assigned Joint Terminal Attack Controller (JTAC), WM experienced a standby generator failure and had to return to base (RTB). (Tabs V-1.11 thru V-1.13, V-3.16) MP held overhead Balad AB and then refueled from an airborne tanker until WM could get a spare aircraft and rejoin the flight as briefed in their assigned airspace. (Tabs V-1.11 thru V-1.13, V-3.16)

MP flight contacted the JTAC as they entered their assigned airspace. (Tab V-1.13) JTACs are highly trained ground personnel whose duties include controlling aircraft and approving release of air-to-ground ordnance. They are often embedded with ground forces and always fall under the control of the ground commander. During the first three hours, the mishap flight was uneventful as the fighter aircraft executed benign NTISR "overwatch" in their assigned airspace. At approximately 1206L, MP flight was tasked to perform NTISR for a sedan parked next to a building. The tasking came from a flight of helicopters that MP flight was supporting. (Tab V-1.13 thru V-1.14)

At 1208L, the flight of helicopters told MP that they needed continuous intelligence, surveillance, and reconnaissance (ISR) coverage of the area and requested that MP flight perform "yo-yo" operations as required. "Yo-yo" operations are defined as one aircraft of a flight of two remaining on station while the other aircraft refuels with an airborne tanker in order to ensure aircraft sensors maintain 100% coverage of the assigned target area.

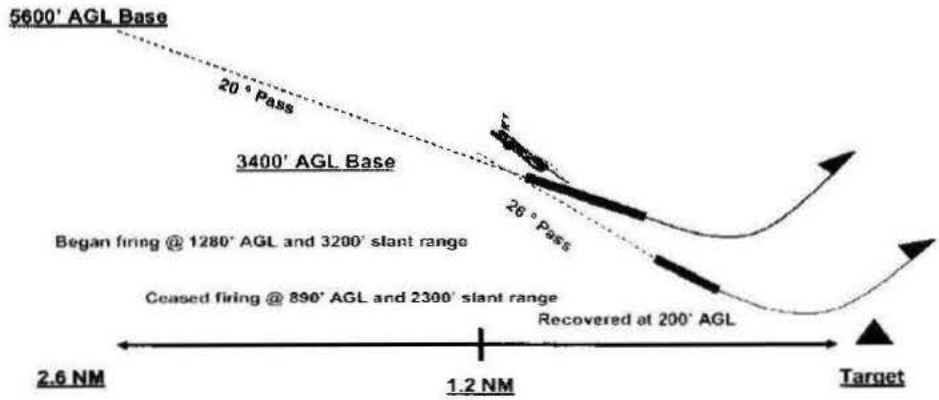
At 1212L, one of the helicopters in the flight experienced a hard landing and was unable to fly. From 1213-1227L, information on the downed helicopter was passed to MP , including coordinates of the site. At 1230L, WM was tasked to perform NTISR "overwatch" for the downed helicopter site while MP remained with the original NTISR tasking (the sedan next to the building). (Tab V-1.14) At 1240L, MP left the area to refuel. At approximately 1245L, WM was retasked to support a troops in

contact (TIC) situation in the vicinity of the downed helicopter. (Tab V-1.14) This TIC situation occurred between a US ground force that was moving to secure the downed helicopter site and enemy troops and vehicles converging on the area. At 1253L, WM was passed a target of three vehicles that were attacking the downed helicopter site. The JTAC, embedded with the ground force that had moved to secure the site, began to direct WM 's sensors and eyes to the target. The JTAC on the ground was receiving heavy fire from these vehicles. At 1259L, WM was retasked to a small building where the vehicles had approached and parked. (Tabs V-1.15, EE-11.1)

At 1306L, MP returned from the tanker and rejoined with WM . (Tab V-1.16) At 1315:49L, WM successfully employed a Guided Bomb Unit (GBU)-12 on the target building. MP flight was then tasked at 1316L to target three trucks that had fled the target building. (Tab V-1.17) Between 1316L and 1326L, MP and WM made multiple low passes over the trucks to identify them and as shows of force. Shows of force are low passes over suspected enemy to scatter them and keep them from attacking friendly forces without employing ordnance. At 1326L, WM left the target area to refuel and MP remained, supporting the friendly forces under attack. (Tabs V-1.19 thru V-1.22, EE-11.1)

At 1330L, MP successfully identified two enemy trucks with passengers and weapons in the back and at 1331:30L rolled in for his first of two strafe passes to strafe the lead truck. (Tab EE-11.1) His aircraft parameters at his base position prior to roll-in were 3400' AGL and 380 knots indicated airspeed (KIAS), 1.2 nautical miles (nm) from the target. (Tabs EE-1.1, DD-1.1) His aircraft parameters at employment were 26 degrees nose low at 440 KIAS. He squeezed the trigger at 1280' above ground level (AGL) at 3200' slant range and released the trigger at 890' AGL and 2300' slant range (Tabs J-9, DD-1.1, EE-1.1)

1st Attack Parameters



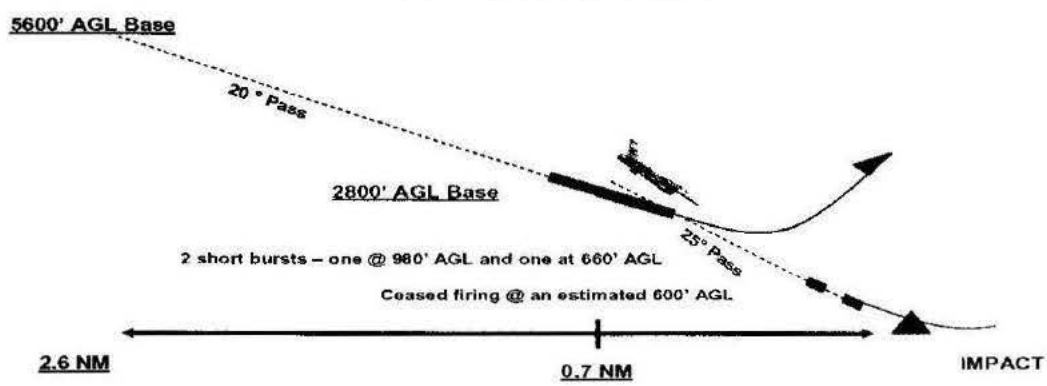
During the first strafe pass, MP received predictive ground collision avoidance system (PGCAS) initiated warnings in his multi-function displays (MFDs) approximately 2 seconds prior to employing the gun. MP also received PGCAS warnings in his

heads-up display (HUD) approximately 1.5 seconds prior to employing the gun. The pull-up voice message was initiated at the same time as the HUD warning. (Tab J-8) PGCAS is a predictive system in the F-16 that warns the pilot of an impending ground collision based on an electronic map of the earth stored in the aircraft and the aircraft's current location. It includes a buffer for pilot reaction time and assumes up to a 5 g pull. It includes both visual and aural cues. When, based on the above buffers, the system predicts that the aircraft will descend lower than 50', large flashing "X"'s are displayed on the pilot's MFDs. The MFDs are two screens located just above the pilot's knees. Approximately one second later, a large flashing "X" is displayed in the pilot's HUD and the aural cue "Pull-up, Pull-up" is transmitted in the pilot's headset. The HUD is the glass pane directly in front of the pilot. Airspeed, attitude, altitude, and weapons symbology are projected on this display in order to allow the pilot to receive this valuable data without having to look down inside the aircraft. The PGCAS system in the mishap aircraft was determined to have been working properly at the time of the mishap based on data downloaded from the crash survivable flight data recorder (CSFDR), commonly known as the aircraft's black box, and from review of the mishap aircraft (MA) HUD tape. (Tabs J-13, EE-1.1)

After the first strafe pass, MP initiated a 6.2 g recovery and recovered at 200' AGL (1300' below planned) damaging the lead truck in the attack. (Tabs J-9, DD-1.1, EE-1.1)

MP then immediately initiated a 4-5 g right hand turn to reattack the trail vehicle. His aircraft parameters at his base position prior to roll-in for his second pass were 2800' AGL and 340 KIAS, 0.7 nm from the target. (Tabs DD-1.1, EE-1.1) His aircraft parameters at employment were 25 degrees nose low at 384 KIAS. (Tab J-10) He squeezed the trigger at 980' AGL and again, 1.5 seconds later, at approximately 660' AGL. (Tabs J-10 thru J-11) Approximately 0.18 seconds after releasing the trigger, MP began a maximum aft stick pull (maximum climbing force) to recover the aircraft. (Tab J-11)

2nd Attack Parameters



During the second strafe pass, MP received PGCAS initiated warnings in his MFDs approximately 2.75 seconds prior, and his HUD approximately 1.5 seconds prior, to employing the gun. The pull-up voice message was initiated at the same time as the HUD warning. (Tab J-10)

At 1332:34L, MP impacted the ground, fatally injuring the mishap pilot (MP). His parameters at impact were approximately 9 degrees nose up at 6.44 g. (Tab J-11)

e. Impact

Aircraft S/N 90-0776, configured with two AIM-120 missiles, a GBU-38 500-lb Joint Direct Attack Munition, a Triple Ejector Rack with two GBU-12 500-lb Laser-guided bombs, one Litening targeting pod, and two 370 gallon wing fuel tanks, impacted the ground while supporting troops in contact with enemy forces at approximately 1332 Local (1032 Zulu) on 27 November 2006, 20 miles northwest of Baghdad, Iraq. (Tab B-3)

Two seconds prior to impact, the aircraft was traveling at approximately 408 KCAS, 660 ft AGL, pitched nose down at 22 degrees, and descending at 327 ft/sec. An aggressive maximum effort attempt to climb was initiated three tenths of a second after the above parameters which ultimately resulted in a 9 degree nose up condition half a second prior to impact. Though the nose was raised above the horizon prior to impact, the angle of attack was 15.47 degrees resulting in a decent that brought the tail of the aircraft into contact with the terrain creating a downward acceleration of the nose prior to its impact. (Tab J-11)

The exact vertical velocity at the time of impact is unknown but was estimated at between 100 and 160 ft/sec as an extrapolation over time from the last known value of 192 ft/sec seven tenths of a second prior to impact, assuming a continuous effort to recover from the decent. (Tab H-8) The resulting low angle, high speed impact and subsequent tumbling completely destroyed the cockpit area and severely damaged the ejection seat. (Tab H-7)

f. Life Support Equipment, Egress and Survival

Analysis of the recovered ejection seat indicated that the MP made no attempt to eject. (Tab H-5) None of the ejection initiation mechanisms or actuators had been manually activated by the MP. (Tab H-6)

Aerial photography revealed a large burnt area of ground centered nearly 500 feet from the initial impact point which represents where the majority of the aircraft broke apart. (Tab S-15) Larger and heavier pieces traveled further across the debris field as demonstrated by the engine core which came to rest 3,937 ft from the initial impact point. (Tab H-7)

Following impact, there was extensive damage to the ejection seat during its separation from the aircraft and subsequent tumbling to rest approximately 1,475 feet from the initial impact point. The considerable seat damage caused extraction of the main

parachute due to liberation of its storage container and release of the pilot from the seat due to ripping of the harness release cable and linkages.

Survivability analysis was accomplished based on the estimated vertical deceleration forces encountered on impact. Stopping distance had to be estimated since precise measurements could not be accomplished in the hostile environment of the crash site. The MA impacted the ground with a force between 104 and 795 G. (Tab H-8 thru H-9) The entire range of estimated forces between 104 G and 795 G in the vertical axis significantly exceeds the 83 G known to produce fatal incapacitation. Given the MA's rapid deceleration, the MP would have been fatally incapacitated before the seat separated from the destroyed cockpit and traveled an additional 1,000 feet from the point where the aircraft broke apart.

g. Search and Rescue

At 1333L, approximately 30 seconds after the 1332:34L impact, the Air Support Operations Center (ASOC) reported a downed aircraft. (Tab EE-11.2) At 1339L, the Joint Personnel Recovery Center (JPRC) (the agency tasked with coordinating the rescue of a downed pilot) declared a personnel recovery (PR) event. (Tab EE-11.2) A PR event is declared any time an aircraft is reported down and initiates the aircrew recovery mission planning process. At 1349L, an additional JTAC assumed control of the airspace for the ground on-scene commander (OSC). (Tab EE-11.2)

By 1349L, a Predator unmanned aerial vehicle (UAV) was on scene and had sensors on the crash site at 1352L. (Tab EE-11.2) The Predator's sensors include several cameras that Predator sensor operators can use to monitor ground activity. At 1401L, an already airborne two-ship of F-16s was retasked as the airborne combat search and rescue (CSAR) OSC and WM had returned to the area to provide "overwatch". (Tabs V-1.22 thru V-1.23, V-13.5 thru V-13.6, EE-11.2)

At 1449L, the ground OSC expanded the restricted operating zone (ROZ) over the downed helicopter to cover both crash sites (the downed helicopter and the downed F-16) and closed both crash sites to further assistance due to the intensity of the on-going firefight. (Tab EE-11.2) A ROZ is used when a controlling agency needs to restrict operations over a particular area on the ground due to increased interest or activity.

Due to the determination that MP made no attempt to eject and the intense firefight that continued in the area for several hours, an operational decision was made not to send ground and additional air forces to the F-16 crash until the area was secure. (Tab V-17.7 thru V-17.8) At the time, it was unknown whether enemy fire had shot down either aircraft. The effort therefore focused on the friendly forces under fire.

From 1535-1641L, the F-16s and Predator already on scene employed ordnance multiple times in an attempt to protect the crash site. (Tabs V-13.6 thru V-13.7, EE-11.2) At 1800L, a Marine quick reaction force (QRF) was launched from Balad AB to secure both

crash sites. (Tab EE-11.2) After fighting their way to the area, the crash sites were deemed secure and the exfiltration of the helicopter crash site was complete at approximately 1900L. (Tabs V-17.7, EE-11.2) No body was found by those securing the crash site. (Tab V-17.8) Between 2100-2119L, an US Army unit investigated reports of the location of the body and forcefully entered five buildings at the suspected location but found nothing significant to report. (Tab EE-11.2)

By 2130L, United States Air Force (USAF) personnel also arrived on scene at the F-16 crash site. (Tab EE-11.2) At 2300L, the mishap aircraft (MA) ejection seat was found. (Tab EE-11.2) At 0051L, the USAF personnel left the crash site with DNA evidence recovered, which was later determined to be that of the MP. (Tabs V-17.7, EE-11.2) A search for the mishap pilot's remains is still ongoing at the time of this writing as a Joint Forces Commander priority.

h. Recovery of Remains

The pilot's body was not recovered by coalition forces. Skull fragments were recovered from the crash site approximately eight hours after the crash. The delay in recovery of the remains was due to continued hostilities and the considerable effort required to secure the crash site. (Tabs H-7, V-3.26 thru V-3.27) The partially recovered remains were transported to Dover AFB, DE and examined by personnel from the Armed Forces Institute of Pathology. On 1 Dec 2006, DNA testing positively identified the recovered remains as belonging to the MP.

5. MAINTENANCE

a. Forms Documentation

Maintenance histories for all Air Force aircraft are documented in a set of forms called the Aerospace Vehicle Flight Report and Maintenance Record, commonly referred to as the Aircraft Forms Technical Order (AFTO) 781 series, and in a computer database system known as Integrated Maintenance Data System (IMDS). All existing aircraft 781 series forms were reviewed for accuracy and completeness. This information was used to determine the condition of the Mishap Aircraft (MA), F-16C, S/N 90-0776, prior to the mishap.

Between 28 October 2006 through 25 November 2006, IMDS data indicated that the MA completed 18 sorties for a total of 81.7 flight hours. (Tab D-4) Of these sorties, 16 returned with landing status of Code 1 (Aircraft mission capable with no additional discrepancies) and 2 sorties returned landing status of Code 3 (Aircraft or system has major discrepancies in mission essential equipment that may require extensive repair or replacement prior to further mission assignment). (AFI 21-101, Aircraft and Equipment Maintenance Management, 29 June 2006, Table 4-1, pg 75)

One of the Code 3 landing status sorties was for an auto transfer to hybrid discrepancy on the non-mishap engine. This discrepancy was corrected by replacing the Main Engine Control. The second Code 3 landing status sortie was for a Fire Control Radar discrepancy. This discrepancy was corrected by replacing the Programmable Signal Processor. (Tab D-4) There is no evidence to indicate any of the discrepancies during this period prior to the mishap were contributing factors to the mishap.

At the time of the mishap, the MA AFTO 781A (Maintenance Discrepancy and Work Document) had 2 minor open discrepancies. These discrepancies would not warrant grounding or discontinued use of the aircraft. The Litening Targeting Pod had two Maintenance Fault Listing (MFL) codes and the Litening Targeting Pod required an In-Flight Ops check of the Data Link. (Tab D-11) Neither of these open discrepancies contributed to the mishap.

The MA AFTO 781K, Section D (Urgent Action, Outstanding Routine Action Time Compliance Technical Orders (TCTO) and Delayed Discrepancies) had 18 open maintenance actions at the time of the mishap. TCTOs are fleet-wide directions to perform specific maintenance actions within a specified time period. The MA had 11 open TCTOs. (Tab D-16) None of these TCTOs were overdue. The remaining seven discrepancies were Delayed Discrepancies. (Tab D-18) A Delayed Discrepancy is a repair that is delayed until a part is available or until there is sufficient aircraft downtime to accomplish the repair. None of the open TCTOs or Delayed Discrepancies contributed to the mishap.

b. Inspections

The MA AFTO 781K, Section C (Calendar and Hourly Inspection Schedule) had no inspections overdue at the time of the mishap. (Tab D-14 thru D-15)

The major scheduled inspection for the F-16C is the phase inspection which is accomplished on a 400-hour inspection cycle. The last phase inspection on the MA was completed 18 April 2006 at aircraft time 3886.8 hours. Since the phase inspection, the aircraft had accumulated 238.8 hours. In addition to the phase inspection, there are numerous periodic inspections on aircraft systems/equipment. These inspections are tracked in AFTO Forms 781K.

The engine inspection program includes a 200-hour phase inspection and a 100-hour borescope inspection, both based on flight hours. This was the first flight for this engine since being received into the AOR as a spare engine. (Tab D-22) The last shop visit for the Mishap Engine (ME), S/N GE0E509929, was 14 June 2006. It had a number of parts replaced during Jet Engine Intermediate Maintenance performed at Spangdahlem AB, GE. The ME had an engine running operational check before being shipped and an engine running operational check after installation in the MA. All checked good.

c. Maintenance Procedures

There is no evidence that indicated that the maintenance procedures of the 524 Aircraft Maintenance Unit (AMU) were a contributing factor to the mishap.

d. Maintenance Personnel and Supervision

There is no evidence that the training, expertise, or supervision of personnel performing assigned tasks on the MA were a contributing factor to the mishap.

e. Fuel, Hydraulic, and Oil Inspection Analysis

Samples were taken of jet fuel (JP-8) after the mishap from the fuel trucks/tanks and oil fluids from the associated servicing equipment. (Tab U-1, U-2, U-6) The liquid oxygen (LOX) cart used to service the aircraft was empty and therefore was not tested after the mishap. However, prior the LOX cart's use on the MA, it was tested and passed. (Tab U-3, U-4)

The ME had Oil Analysis Program tests done after engine operational checkout runs were accomplished upon completion of Jet Engine Intermediate Maintenance at Spangdahlem AB, Germany and after installation/operational checkout in the MA. All tests performed were normal and not a factor in the mishap. (Tab U-5, U-9)

f. Unscheduled Maintenance

In addition to the discrepancies previously noted, the only significant unscheduled maintenance actions included an engine change and a station 7 Joint Direct Attack Munition (JDAM) Bus Fail discrepancy.

Due to the station 7 Bus Fail discrepancy, the MA's configuration was changed so that the JDAM was moved to station 3 and the two GBU-12s were moved to station 7. (Tab D-18) This change permitted maintenance personnel to delay repair of the Bus Failure until the aircraft had some downtime.

During a borescope inspection of the non-mishap engine, a torn fifth stage compressor blade was found. This required an engine remove and replacement. The engine change was completed on 26 November 2006. The mishap flight was the first flight of the ME in the MA.

Prior to the mishap, in November 2006, the aircraft was impounded on two separate occasions. Impoundments isolate and control access to an aircraft and maintenance records so an intensified investigation can be completed. The first impoundment of the MA was due to a missing rivet and a missing half of an engine hydraulic line clamp.

Both missing items were found and reinstalled. (Tab U-7) The second impoundment was due to a missing bolt and washer from a spraybar mount pad on the engine. (Tab U-8) Both of the above maintenance actions on the engine were accomplished on the MA before the MA's engine was replaced.

A comprehensive review of all unscheduled aircraft maintenance actions documented in the AFTO 781 Forms revealed no evidence that any unscheduled maintenance action contributed to this mishap.

6. AIRCRAFT AND AIRFRAME SYSTEMS

a. Condition of Systems

At the time of the mishap, the MA was configured with two AIM-120 missiles, a GBU-38 500-lb Joint Direct Attack Munition, a Triple Ejector Rack with two GBU-12 500-lb Laser-guided bombs, a Litening targeting pod and two 370 gallon wing fuel tanks. (Tabs V-1.26, V-4.3)

Structural breakup was severe and occurred after the aircraft's initial contact with the ground. Due to threat level of the area where the aircraft impacted, Interim Safety Board (ISB) members, aided by ground forces, only had a few hours to recover wreckage. This limited recovery of the MA wreckage to the portions that the ISB deemed pertinent and/or recoverable. The recovered components and aircraft parts were secured at Balad AB, Iraq.

The board thoroughly studied pictures of the recovered mishap aircraft wreckage, the post-mishap contractor analysis, and maintenance documentation. All mechanical and electrical systems required for flight appear to have been operating normally prior to impact. No aircraft anomalies were found to have contributed to the mishap

b. Component Testing

(1) Crash Survivable Flight Data Recording System (CSFDR)

The Crash Survivable Memory Unit (CSMU) was recovered and sent to the Air Force Safety Center (AFSC) after which the seven CSMU memory chips were sent to Lockheed Martin Aeronautics Company (LM-Aero) for evaluation. LM-Aero was able to download the chips one at a time using LM-Aero's CSFDR laboratory. The stored data from the seven chips were combined into one usable file using data decompression and display software programs. LM-Aero was able to compile a chronological summary of significant events using the CSMU and SDR data. (Table J-5 thru J-11)

Three circuit cards recording data stored in the SAU were recovered and sent to LM-Aero for evaluation. One card which records only built-in-test results and life tracking data was too badly damaged to attempt recovery. The other two cards were successfully downloaded. Data recorded during the entire sortie was recovered from the two cards. Analysis of the data indicated normal aircraft operation. (Tab J-12)

The flight control surfaces responded normally to flight control inputs. Recorded analog and discrete signals suggested normal operating systems. (Tab J-13) The only exception to this was the targeting pod. Data showed multiple occurrences of a targeting pod degrade MFL. This discrepancy was known and documented in the aircraft's forms prior to flight. (Tab D-13) The aircraft forms describe the discrepancy as "no degrade" and there were no pilot report discrepancies on the Litening Targeting Pod indicating a degradation of its laser functionality.

The CSFDR data contained no indication of an aircraft malfunction contributing to the mishap.

(2) Seat Data Recorder (SDR)

The Digital Flight Control System (DFLCS) SDR was sent to LM-Aero and successfully downloaded. The data indicated two DFLCS MFLs during the flight. First, a fault concerning the Autopilot was triggered multiple times during the mishap flight. However, this recorded fault was due to MP maneuvering while the Autopilot was engaged. There were no actual operational deficiencies with the MA's Autopilot. The second fault concerned conflicting data from an accelerometer. Since the system is quad-redundant and the misread data would have been voted out by the digital flight control computer, the single erroneous data point would have had no impact on the MA's flight control. (Tab J-14 thru J-18)

(3) Engine Casing and Jet Fuel Starter (JFS) Accumulator Pneumatic Reservoir

The Air Force Research Laboratory Materials Integrity Branch (AFRL/MLSA) evaluated holes found in the engine casing and JFS accumulator pneumatic reservoir. The evaluation was to determine whether the damage could have been caused by small arms fire. Both exterior and interior surfaces around and within the holes on both structures were examined to detect the presence of copper and/or lead. Neither of these elements were observed anywhere on the structures examined. The absence of copper or lead traces indicates that the holes were not created by small arms fire. (Tab J-3)

(4) Caution Light Panel

The 552 Combat Sustainment Squadron (CBSS) and LM-Aero analyzed the condition of the caution light panel. The 552 CBSS determined that the SEC (secondary engine control) and ELEC SYS (electrical system) lights were illuminated at impact. However, there was no recorded data indicating any faults during the mishap sortie relating to these systems. LM-Aero concluded that these caution lights illuminated due to the loss of related systems prior to total aircraft power loss. In other words, the caution lights were illuminated merely due to the fact that all of the aircraft's systems did not simultaneously fail at precisely the same time when the aircraft impacted the ground. (Tab J-18 thru J-19)

c. Summary

The aircraft was operating as designed and the airframe and aircraft systems were operating normally. There is no evidence to indicate that the aircraft configuration, airframe, or aircraft systems contributed to the mishap.

7. WEATHER

a. Forecast Weather

The weather forecast indicated no advisories or warnings for the takeoff and departure phases of the mishap sortie. The terminal area (airfield) forecast at takeoff time called for no significant weather in the area. Forecast winds were 320° at 7 knots. Forecast temperature was 18° C. Forecast weather for the assigned area was the same. (Tab F-3)

At the impact time, the forecast for the impact area called for no significant weather in the area. Forecast winds were 320° at 7 knots. Forecast temperature was 21° C. (Tab F-3).

b. Observed Weather

The observed weather conditions at Balad and in the target area were a scattered layer of clouds at 25,000 feet MSL. Below this scattered deck, the weather was clear and the visibility was unrestricted. (Tab F-5)

Conclusions

The mission was conducted within the prescribed operational weather limitations and weather was not a factor in the mishap.

8. PILOT QUALIFICATIONS

The MP was an experienced and competent aviator, compiling 1112.1 hours in the F-16 C/D (Block 25, 30, 40) aircraft. (Tab G-5) His assignments included flying F-16s at Aviano Air Base, Italy, in the 555th Fighter Squadron, a unit that primarily focuses on Forward Air Control (Airborne) (FAC(A)) and Close Air Support (CAS). He also flew at Luke AFB in the 62nd and 309th Fighter Squadrons, units that train pilots how to fly and employ the F-16. (Tab EE-7.1) The MP's recent flying time in Iraq was as follows (Tab G-7):

	Total Hours	Total Sorties
Last 30 Days	32.2	7
Last 60 Days	68.9	14
Last 90 Days	106.5	21

The MP was not enrolled in any formal or upgrade training at the time of the mishap.

Air Force fighter pilots are required to fly several different types of sorties and events to maintain their skill level and proficiency. As a fighter squadron prepares to deploy to support combat operations, a tailored "spin-up" program is developed to focus training on expected missions in theater and the required skill sets necessary to execute these missions. The 524th FS prepared a detailed and robust program which included, but was not limited to, a list of flying events and academics for each member to complete prior to deploying to Iraq. (Tabs EE-5.1 thru EE-6.1) A three-day temporary duty (TDY) was scheduled for the MP to visit Cannon AFB, NM to accomplish as much of the events as possible. 524th FS supervision drafted a tailored spin-up for the MP, due to the limited time of his visit, which included an academic review, a simulator, and two sorties with squadron supervision. (Tab EE-8.1 thru EE-8.2)

On his TDY to Cannon AFB, NM, the MP accomplished a review of the academics listed in the 524th FS Spin-up, a simulator to familiarize targeting pod (TGP) and engine differences, and two sorties with 524th FS leadership. (Tab V-3.7)

The MP's academic knowledge of specific tactics was validated by Lt Col Redacte 524th FS Commander, during mission planning prior to his first sortie. (Tab V-3.8) The simulator was administered by a squadron supervisor, Capt Redacted. (Tab V-3.7) The MP flew two sorties locally at Cannon AFB in 524th FS aircraft. His first sortie, led by Lt Col Redact , included level and diving deliveries employing simulated GBU-12s (500lb Laser Guided Bombs (LGBs)) in a non-tactical scenario and progressed to a tactical

scenario utilizing JTACs on the ground for target talk-ons and simulated LGB employment. (Tab V-3.8) Simulated HAS attacks were also accomplished on this sortie. (Tab V-3.8) The MP's second sortie, led by Capt Redacted, was similar to the first, focusing on the same basic Operation Iraqi Freedom (OIF) skill sets of LGB deliveries with JTACs and simulated HAS on moving personnel. (Tab V-7.3 thru V-7.4)

The MP instructed and executed every basic mission the F-16 performs as an Instructor Pilot at Luke AFB. The MP's squadron was administering the Surface Attack and Surface Attack Tactics syllabus to students during the 3 months prior to his deployment to Iraq. (Tab V-11.4) This phase of instruction focuses on teaching students how to employ air-to-ground ordnance, to include LAS/HAS. (Tabs V-10.4 thru V-10.5, V-11.4) Of the 31 sorties the MP flew in those three months prior to deploying to Iraq, 10 sorties were air-to-ground sorties. Five sorties were accomplished in the month of August, the month before he deployed. (Tab V-11.4 thru V-11.5) Generally, these sorties would include CAS (Close Air Support), BSA (Basic Surface Attack - dropping practice ordnance) and LAS/HAS at a conventional scoring range at Barry M. Goldwater Range in southern Arizona. (Tabs V-10.4, V-11.4) The MP upgraded to Standardization and Evaluation Flight Examiner (SEFE) Pilot just prior to deploying to Iraq. (Tabs G-33, V-11.3) This upgrade is offered to only those pilots who demonstrate the highest level of professionalism, airmanship, and understanding of Air Force Instructions and Flying Regulations.

The MP arrived at Balad Air Base, Iraq on 7 Sep 06. (Tab EE-3.1) He was current and qualified in the F-16 C (Block 25/32 and 40/42). (Tab G-31) He satisfied all indoctrination procedures at Balad AB and was subsequently cleared to fly OIF missions by the 332nd Expeditionary Operations Group Commander (EOG/CC), Col Scott Dennis, on 10 Sep 06. (Tabs V-3.11, EE-3.2) He was assigned to the 332nd EOG as the Chief of Standardization and Evaluation (332nd EOG/OGV). (Tab V-16.2 thru Tab V-16.3) The Chief of Standardization and Evaluation works directly for the EOG commander and is responsible for ensuring all aspects of flying are performed in accordance with Air Force Instructions and regulations. As the Chief of Standardization and Evaluation, the MP was thoroughly familiar with local area procedures and regulations. Of note, he would brief incoming flying units on the AOR procedures. (Tab V-1.10) The MP's flying currency (averaging seven combat sorties a month) was normal, if not above average, for an attached flyer at Balad. (Tabs V-16.3, V-17.4) Furthermore, the MP was encouraged to fly as many combat sorties with the 524th EFS as possible. (Tab V-17.4)

According to his peers, the MP was an outstanding F-16 pilot and instructor. (Tabs V-1.5, V-2.3, V-9.3, V-10.3, V-11.3) His assignments and experience instructing in the F-16 put him in the top echelon of F-16 fighter pilots. The MP was known for meticulous mission planning and preparation. (Tabs V-1.7, V-2.3, V-10.3 thru V-10.4) In addition, only those pilots who have demonstrated extensive ability are assigned to the Flying Executive Officer position due to balancing a demanding office and flying schedule. (Tab V-17.3) The MP was a skilled and accomplished aviator who excelled in all areas. (Tabs V-1.10, V-3.15, V-10.4) The MP was also portrayed as an outstanding Air Force officer. (Tabs V-8.4, V-9.3, V-10.3, V-16.2 thru V-16.3, V-17.3) He was described as an

"example" for other officers. (Tabs V-10.3, V-10.7, V-17.3) The obvious trust placed in his talents and level-headedness by his wing leadership were behind his selection as the 56th FW Flying Executive Officer and ultimately his selection to be assigned as 332nd EOG/OGV (Chief of Standardization and Evaluation) at Balad AB, Iraq. (Tabs V-10.3, V-17.3)

9. MEDICAL

a. Qualifications

The MP was medically qualified for flight duty. His last flight physical was accomplished 21 Feb 2006. His medical records contain a current Medical Recommendation for Flying or Special Operational Duty AF Form 1042, dated 21 Feb 2006. (Tab EE-9.1)

b. Health

A review of the MP's medical records revealed no illness that contributed to the accident.
Redacted

c. Pathology

Three large skull fragments were recovered from the crash site near where the ejection seat came to rest approximately 1475ft from the point of initial impact. All three fragments were positively identified by DNA methods. No other tissue was available for examination. These fragments represent a significant portion of the frontal and parietal bones indicating extensive and fatal blunt trauma on initial impact. (Tab X-1 thru X-1.2)

d. Toxicology

Toxicological examination of the MP was not possible.

e. Lifestyle

There is no indication the MP engaged in any unusual habits, behaviors or stressors that contributed to the accident. (Tabs V-1.4 thru V-1.6, V-2.3 thru V-2.4, V-3.6, V-7.3, V-8.3 thru V-8.4, V-9.2 thru V-9.3, V-10.2 thru V-10.4, V-11.2 thru V-11.4, V-12.2 thru V-12.4, V-17.3, V-18.5 thru V-18.6)

f. Crew Rest and Flight Duty Period

The MP complied with crew rest and flight duty period requirements on the day of the mishap. Witness testimony indicated that the MP completed his duties from the night prior in time to allow nearly 24 hours before having to return to begin official duties on the day of the mishap. (Tab V-2.7) The requirements for crew rest and flight duty period (FDP) are found in AFI 11-202, Volume 3, *General Flight Rules* paragraph 9.3.5 which states "Crew rest is required prior to in-flight duties. The crew rest period is normally a minimum 12-hour non-duty period before the FDP begins. Its purpose is to ensure the aircrew member is adequately rested before performing flight or flight related duties. Crew rest is free time, which includes time for meals, transportation, and rest. Rest is defined as "a condition that allows an individual the opportunity to sleep." Additional testimony indicated that the MP was present for duty on the morning of the mishap alert and behaving in his usual energetic manner. (Tabs V-1.6, V-3.14 thru V-3.15, V-4.2 thru V-4.3, V-5.4)

10. OPERATIONS AND SUPERVISION

At the time of the mishap, the 524th Expeditionary Fighter Squadron (EFS) was engaged in 24 hour combat operations in order to meet Combined Air Operations Center (CAOC) tasking on the Air Tasking Order (ATO). The CAOC is a command and control (C2) agency responsible for matching air and space missions from the joint forces commander with available assets in theater. The ATO is a computerized product sent to deployed units to describe their daily tasking. While busy, the 524 EFS was operating at a typical pace for deployed units at Balad.

Supervision at the squadron, group, and wing level was appropriate and fully engaged. When the MP stepped to fly, he was trained and ready to accomplish the assigned mission. Of note, eleven days prior to the mishap, the 524th EFS Commander, Redacted published a Pilot Read File (PRF) article. (Tab EE 4.1) The PRF is a communication tool used by commanders to provide guidance and/or highlight concerns. All pilots flying in the squadron are required to read PRFs before stepping to fly. The 16 November PRF was intended to refocus the squadron at the midpoint in its deployment. Operations and supervision were not causal to this mishap.

11. HUMAN FACTORS ANALYSIS

Human factors contribute to the majority of aircraft mishaps. Analysis indicates that human error is identified as a causal factor in 80 to 90 percent of mishaps, and is present but not causal in another 50 to 60 percent of all mishaps, and is therefore the single greatest mishap hazard. (Tab EE-10.1 thru EE-10.4) The Department of Defense Human Factors Analysis and Classification System includes a list of the potential human factors that are contributory to a mishap. All factors within the guide were assessed for

relevancy regarding the mishap. The following is a discussion of the human factors that may have contributed to this mishap.

Channelized Attention (DoD HFACS Code PC102) is a factor when the individual is focusing all conscious attention on a limited number of environmental cues to the exclusion of others of a subjectively equal, higher, or more immediate priority, leading to an unsafe situation. It can be described as a tight focus of attention that leads to the exclusion of comprehensive situational information.

The MP's flight path was recreated using the crash survivable flight data recording system and revealed that he was flying tight circles at low altitude for 15 minutes while attempting to visually identify the intended hostile vehicles. These low and tight circles are indicative of the MP's channelized attention as he worked to maintain constant visual contact with the fast moving vehicles while looking over his shoulder in a manner commonly referred to as "Pad Locked". Circling low and the compulsion to keep his eyes on the intended target prevented him from referencing instruments and displays that would have indicated he was not at appropriate/planned attack parameters.

The strafe passes were also initiated significantly closer to the target than practiced or recommended which resulted in an even greater challenge due to there being less time to fire the gun and recover. The combination of beginning the attacks too low and too close due to channelized attention on the moving vehicle produced an unforgiving situation. (Tab J-11)

The Board President flew a sortie in a T-38 in order to recreate the MP's visual view of his ground targets prior to roll in to gauge the difficulty in finding and maintaining a visual on a dark vehicle moving along a dark road. The following photo was taken at the altitude that the MP would have rolled in for his high angle strafe attack had he been operating at planned parameters (5600' AGL):

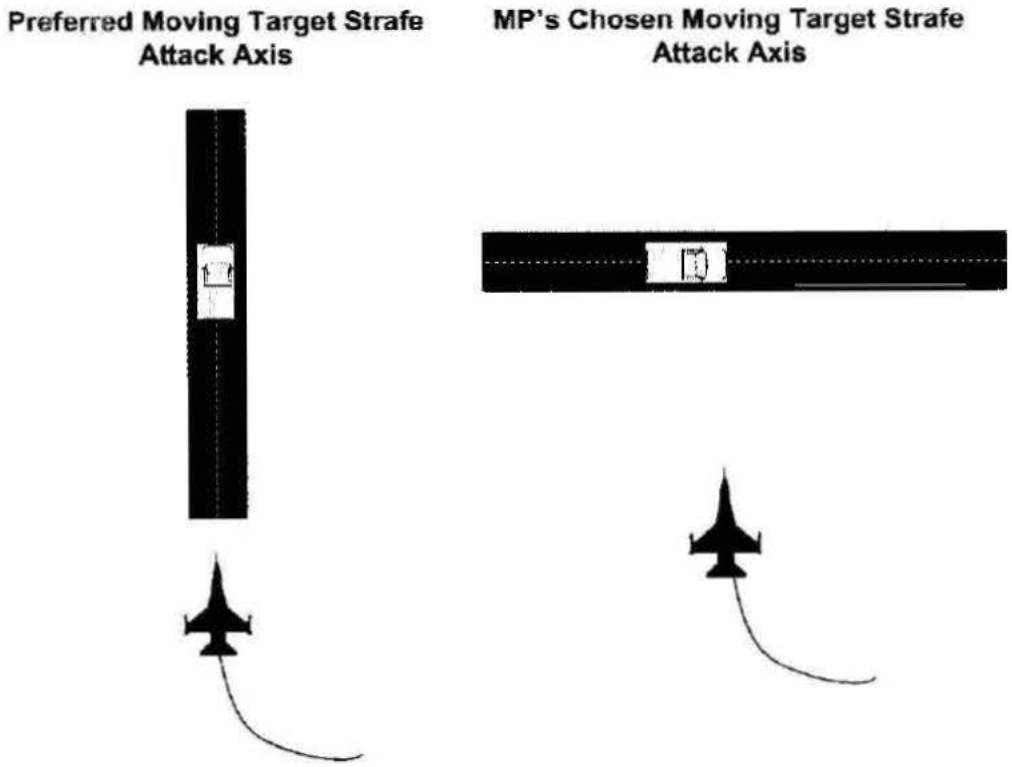
In the above photo, which simulates both the terrain (flat) and the environmental conditions (clear skies), one can barely see any vehicles let alone identify them as carrying weaponry or enemy passengers. The MP may have believed he had to remain below planned attack parameters in order to maintain his visual on the vehicles that were moving at a high rate of speed to escape his attacks.

The next photo was taken at the altitude just prior to the MP's first attack (3400' AGL). In the below photo, one can more clearly see vehicles and detail from this altitude.

Excessive Motivation to Succeed (DoD HFACS Code PC212) is a factor when the individual is preoccupied with success to the exclusion of other mission factors leading to an unsafe situation. The communications between the JTAC and the MP to direct his eyes onto the desired targets was challenging and prolonged due to the conflicting requirements of rapidly engaging the enemy to save coalition lives while also balancing the need to positively identify appropriate targets to avoid civilian collateral damage.

Additionally, conducting a strafe attack against a moving target is dramatically more difficult than a static target. When a target is moving, a pilot must fire in front to ensure the bullets hit the intended target while both are traveling considerable distances. Moving target strafe is preferably performed flying as parallel to the moving target's path as possible since there will be minimal relative motion between the aircraft and the target. The least desirable approach is perpendicular to the target's path of travel as it requires the most continuous correction of the aircraft's aim point and hence the most concentration. Perpendicular strafing of moving targets is not routinely practiced or recommended. (Tab V-18.5) Excessive motivation to succeed may have resulted in the

MP's decision to attack perpendicular to the moving target's path, further complicating his attack. The following diagram depicts the preferred attack axis on the left and the MP's attack axis on the right.



Target fixation, as a subset of channelized attention (DOD HFACS Code PC102) is a factor when an individual is so focused on a single object that he blocks out all other inputs. On both strafe passes, the MP proceeded beyond the visible heads-up display (HUD) warnings that would have been in his field of view while employing the aircraft's gun, as well as ignored an audible pull-up voice message. The MP's disregard of recovery clues suggest that the MP may have been so fixated on his target that he flew his aircraft into an unrecoverable situation. (Tabs V-1.17 thru V-17.23, V-3.18 thru V-3.22, V-13.5 thru V-13.8)

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Primary Operations Directives and Publications

AFI 11-214, *Aircrew*
AFI 11-2F-16 Vol. 1, *F-16 Aircrew Training*
AFI 11-2F-16 Vol. 3, *F-16 Operations Procedures*

AFI 11-202 Vol. 3, *General Flight Rules*
AFI 11-214, *Aircrew, Weapons Director, and Terminal Attack Controller Procedures for Air Operations*
AFI 48-123, *Medical Examinations and Standards*
AFI 51-503, *Aerospace Accident Investigations*
AFI 91-204, *Safety investigations and Reports*
AFMAN 11-217 Vol.1, *Instrument Flight Procedures*
AFTTP 3-3, Vol. 5, *Combat Fundamentals, F-16*
DoD HFACS (Governing Directives)
T.O. 1F-16C-1, *Flight Manual, USAF Series F-16C/D Blocks 25, 30 & 32*
T.O. 1F-16C-34-1-1, *Avionics and Nonnuclear Weapons Delivery Flight ManualUSAF Series Aircraft, SCU-3+, SCU-4, SCU-4.1, SCU-4.2, F-16C/D Blocks 25, 30 and 32*

b. Maintenance Directives and Publications

AFI 21-101, *Aircraft and Equipment Maintenance Management*
T.O. 00-20-1, *Aerospace Equipment Maintenance General Policies and Procedures*

c. Known or Suspected Deviations from Directives or Publications

There were no known or suspected deviations from directives or publications.

13. NEWS MEDIA INVOLVEMENT

a. Initial Queries and Reports

At the time of the mishap, news media interest was high. Press releases were issued from U.S. Central Command Air Forces Public Affairs. The Air Force Link, a web based Air Force news site, and the base links for Luke Air Force Base, Cannon Air Force Base and Balad Air Base all ran the story. Major news networks, including FOX and CNN reported on the mishap. (Tab CC-1.1 thru CC-8.1)

b. Press Conferences

On 28 November 2006, during a Baghdad news conference, a coalition spokesman, Army Major General Redacted , commented on the pilot's duty status.

c. Media or Family Visits to the Crash Site

Neither the media nor the family visited the crash site.

Redacted

20 February 2007

DAVID L. GOLDFEIN
Brigadier General, USAF
President, Accident Investigation Board

STATEMENT OF OPINION
F-16 CG AIRCRAFT ACCIDENT
27 NOVEMBER 2006

1. Under 10 U.S.C. 2254(d), any opinion of the accident investigators as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report may not be considered as evidence in any civil or criminal proceeding arising from an aircraft accident, nor may such information be considered an admission of liability by the United States or by any person referred to in those conclusions or statements.

2. OPINION SUMMARY

By clear and convincing evidence, I have determined that the cause of the accident was the MP's channelized attention manifested by his desire to maintain a constant visual positive identification of targeted enemy vehicles and his subsequent target fixation on these vehicles while they were traveling at a high rate of speed. These two factors, when combined, caused the MP to begin and then press his attack below a recoverable altitude.

By substantial evidence, a contributing factor was the pilot's excessive motivation to succeed while operating in a dynamic and stressful combat environment. This motivation to immediately support friendly forces under fire produced a series of decisions and flight parameters that left little room for recovery on the first strafe pass, and no possibility of recovery on the second pass. During the second strafe pass, the MP started a high angle strafe attack well below normal parameters and too close to the intended target, which positioned the aircraft inside and below normal weapons parameters. During the ensuing dive, the MP became fixated on the small target, pressed the attack below a recoverable altitude, and impacted the ground. The MP died immediately upon impact.

I came to these conclusions following extensive review of the MP tapes, recreation of flight parameters from CSFDR downloaded data, flight in a T38 to recreate the MA parameters, flight in an F16 simulator to recreate conditions during the sortie, and extensive interviews conducted at Cannon AFB, NM; Luke AFB, AZ; Al Udeid AB, Qatar; and Balad AB, Iraq.

3. DISCUSSION OF OPINION

a. The mishap timeline begins at 1305:56 hours local time when the MP returns from the tanker and rejoins his wingman, call sign WM who is working with a Joint Terminal Attack Controller (JTAC) in an established troops in contact (TIC) situation. The JTAC and his fellow troops, while moving to secure a downed helo site, came under intense fire from an enemy that both outnumbered and outgunned existing friendly forces. As several enemy vehicles with mounted weaponry and enemy troops converged on a building, the JTAC verbally directed WM to the target where he delivered a 500-pound precision-guided munition (PGM).

b. Following the explosion from WM s bomb, several vehicles departed the building and began moving at a high rate of speed in the vicinity of the friendly forces.

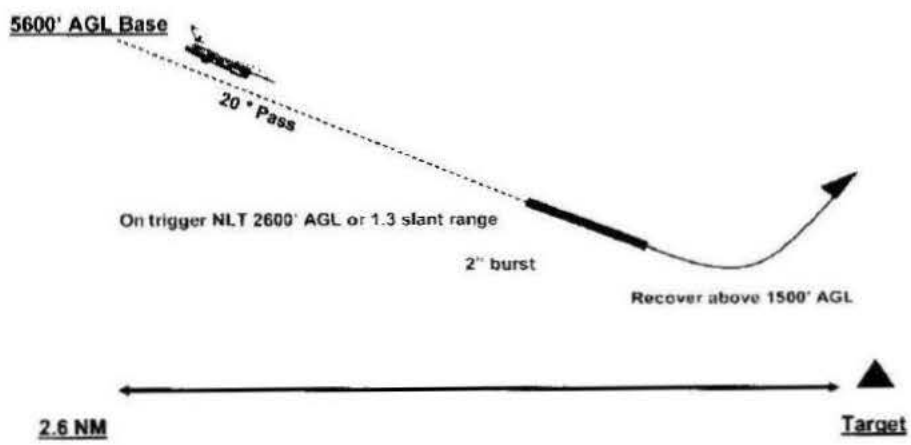
Due to his fuel state, WM departed the area and returned to the tanker to refuel. Hound 56 would not return to the area until after the fatal crash of the MA.

c. Once WM departed the area, the MP transitioned to working with the JTAC to positively identify the enemy vehicles. Despite the weather and visibility being near perfect, the difficulty in positively identifying with 100% accuracy a dark colored vehicle traveling at high speed on a dark road cannot be over-emphasized. Despite clearance to engage, the MP made several low passes at approximately 1000' above ground level (AGL) over the vehicles which resulted in their scattering. The environment was dynamic and the ground combat was intense.

d. After 15 minutes at low altitude working with the JTAC to ensure positive identification of the enemy targets, the MP was able to positively identify three vehicles carrying enemy troops and was again cleared to engage with his 20 millimeter cannon. He had practiced high angle strafe during his spin-up preparation with the 524th EFS at Cannon AFB prior to arriving in theater. In addition, he had received briefings and read academics covering strafe execution in theater and had in-briefed other units on rules of engagement and strafe execution as the 332nd Expeditionary Operations Group Chief of Standardization and Evaluation (OGV). During his flight briefing prior to step, the MP went over strafe execution and was seen by his wingman copying high and low angle strafe execution parameters on his lineup card that he would carry during the mission.

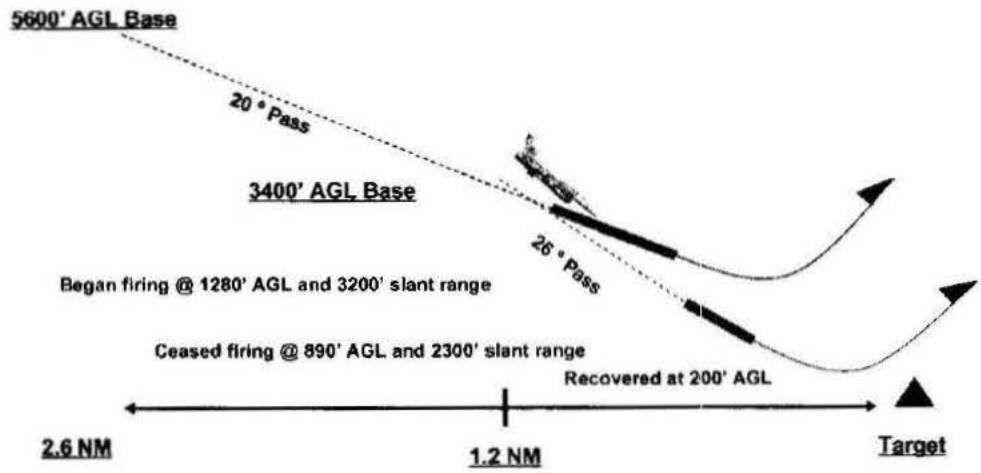
e. The parameters the MP flight stepped to fly with for a high angle strafe pass can be pictured in the following diagram. High angle is defined as any dive angle above 15 degrees. The attack is designed to achieve desired weapons effects and safely recover above 1500' AGL.

Planned/Briefed 20° High Angle Strafe Attack



f. During the MP's first pass, he began the attack well below and far too close to his intended target resulting in a dive angle which was 6 degrees steeper than planned. This can be seen in the following diagram.

1st Attack Parameters



g. It is my opinion that the MP arrived at these parameters due to channelized attention manifested by his desire to maintain 100% positive visual identification on the moving vehicles. There is no indication the MP was using any sensor other than his eyes to find, fix, track, and attack the enemy. I came to this opinion following thorough review of the MP's tapes, flight in a T-38 where I was able to recreate the conditions of the MP's attack prior to roll in on the target, and flight in an F-16 simulator at Luke AFB, AZ, where I was able to safely recreate the MA flight profile through to ground impact on the last strafe pass.

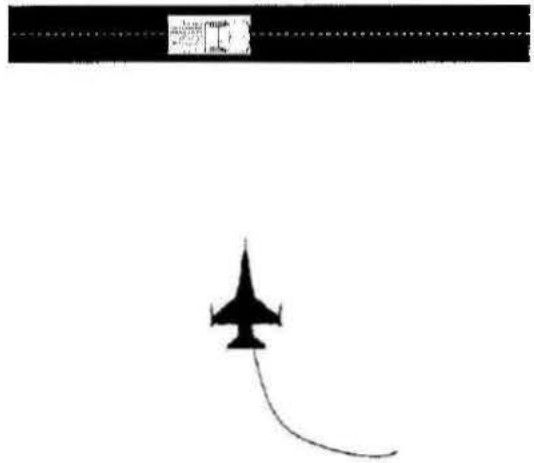
h. It is my opinion that the MP, after having spent 15 minutes at low altitude working diligently to PID the enemy vehicles, remained visually "pad locked" on the enemy. This channelized attention caused him to disregard both visual and audible warning cues inside the cockpit and attempt to execute his strafing attack well below and far too close to his intended target. As previously stated, the difficulty in finding and maintaining a visual on a dark vehicle moving along a dark road cannot be over-emphasized.

i. It is my opinion that the MP had excessive motivation to succeed such that, in order to engage the enemy immediately, caused him to choose the most difficult possible attack axis in reference to enemy vehicle movement after he established PID and received clearance from the JTAC. All academic preparation, his flying spin-up, and his pre-flight briefing emphasized a preferred attack axis down the road thereby minimizing line of sight movement when shooting the 20 MM gun. The MP was operating in a dynamic combat environment where friendly troops were initially under attack at the start of his

working period. The JTAC was under fire and asked for immediate help to subdue and/or deter the enemy from further attacks. The following drawings exhibit the preferred attack axis on the left and the MP's attack axis on the right.

Preferred Moving Target Strafe Attack Axis

MP's Chosen Moving Target Strafe Attack Axis



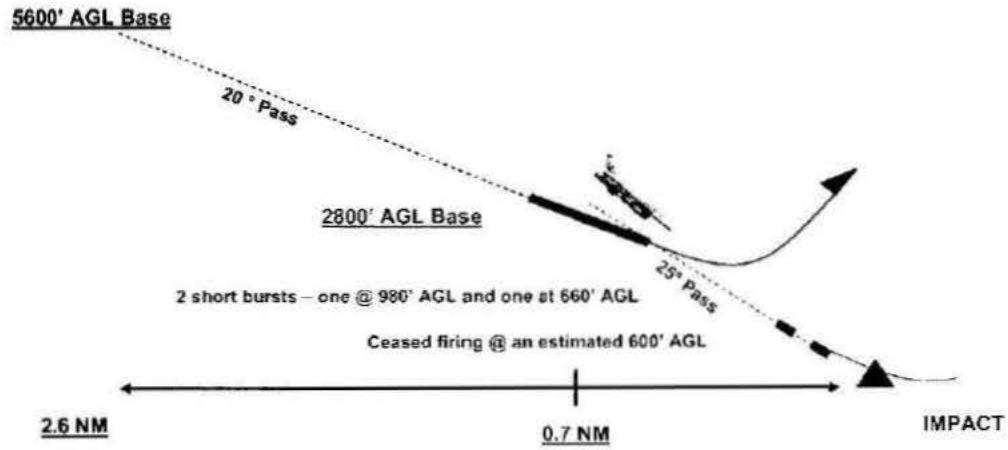
j. Finally, it is my opinion the MP became fixated on his target and, as a result, pressed the attack well below a safe altitude. During the pass, the MP kept the MA in a constant right bank which would be required in order to continue to place the gun sight in lead of a small target moving from left to right in his windscreen at a high rate of speed. Target fixation coupled with the difficulty associated with hitting a small moving vehicle caused him to disregard both visual and audible warning cues in the cockpit that warned him he was too low. Despite this target fixation and extremely low recovery initiation (890' AGL), the MP was successful in damaging the lead enemy vehicle during his first strafing pass.

k. During his maximum G recovery from the first pass, the MA cleared the ground by only 200' AGL before the MP began a hard 4-5G right climbing turn maintaining up to 90 degrees of bank for the next pass. This maneuver is not unlike the flight path flown after a safe escape maneuver is performed on a practice bombing range. A safe escape maneuver is defined as either a climbing or lateral turning maneuver that safely recovers the aircraft and places it outside any potential fragmentation from the weapon being delivered. It is my opinion that the MP pulled the MA into this tight high G turn in order to maintain visual contact while looking back and down over his right

indicate the enemy was attempting to merge with other vehicles in the area which would have made 100% PID even more difficult.

l. During the final pass, it is my opinion the MP repeated the previous attack based on the same causal and contributing factors with only one exception – he pressed even lower than his first attack thus negating the turning room required to recover without hitting the ground. At approximately 1 second prior to impact, the MP realized his predicament and initiated a 6G recovery. While he was able to attain a 9 degree nose up attitude, his downward velocity resulted in ground impact tail first. The following drawing depicts the MA's final pass.

2nd Attack Parameters



m. Shortly after impact, word went out that an F-16 was down. A combination of Predator UAV sensor coverage confirmation, lack of any movement on the ground, no response to radio queries, and visual indications from aircraft in the area that no ejection attempt was made resulted in a determination that the MP had not survived the crash. Further, at the time of impact, the causes of both the helicopter and the F-16 crashes were unknown. Enemy fire had not been ruled out. Finally, an intense firefight between friendly forces and the enemy in close proximity to the crash site continued for several hours. Leadership at all levels therefore made a conscious decision to avoid additional casualties by not attempting a recovery operation until the area was secure. This did not occur until approximately 1900L. It is my opinion that leadership at the 332 AEW and at the CAOC acted correctly given the situation on the ground and the information available.

n. Given the survivability analysis estimating the deceleration force of the initial impact at between 104 and 795 G's and the results of the DNA analysis of the partial remains found at the scene, there is absolutely no doubt that the MP could not have

remains found at the scene, there is absolutely no doubt that the MP could not have survived the initial impact. At the time of this writing, the MP's body has not been found. A search continues and remains a Joint Forces Commander, a Combined Forces Air Component Commander, and a 332 AEW Commander priority.

o. The MP was an outstanding officer and a highly skilled aviator who was adequately trained to perform the mishap sortie. While engaged in a dynamic environment with friendly forces under attack, the MP was at all times keenly focused on the well-being of both coalition ground personnel and Iraqi noncombatants. Tragically, the MP's channelized attention, excessive motivation to succeed and target fixation caused him to press his attack below a recoverable altitude resulting in the destruction of an F-16 and the death of the MP.

Redacted

20 February 2007

DAVID L. GOLDFEIN
Brigadier General, USAF
President, Accident Investigation